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The following communications were read:—

I. On the transit of *Mercury* of the 5th of May 1832. By the Rev. J. Fisher. Communicated by Captain Beaufort.

This observation was made near the landing-place of Pampulha, at Lisbon, in latitude 38° 42′ 30″ N., longitude 36^m 40^s W., with a 45-inch refractor, by Dollond, of 3¾ inches aperture.

"A series of zenith distances of each of the sun's limbs was taken immediately before the contact of *Mercury* with the sun's limb in the morning, and another series at the conclusion of the transit in the afternoon, both of which agreed in assigning the same error to the chronometer.

		Mean solar time. d h m s	Apparent time. d h m s
Ingress	Exterior	4 20 22 46	4 20 26 15
	Centre	4 20 24 55	4 20 28 24
	Interior	4 20 26 4	4 20 29 33
Egress	Interior	5 3 8 56	5 3 12 26
	Centre	5 3 10 30	5 3 14 0
	Exterior	5 3 12 16	5 3 15 46

The first exterior contact was given by estimation, the planet having made a slight impression on the moon's limb before the observation began.

II. Observations of the Occultation of *Saturn* of May 8, 1832.

1. Mr. Lawson and another observed this phenomenon at Hereford, latitude 52° 3′ 16″ N., longitude 2° 42′ 20″ W., with a 5-feet achromatic, by Dollond, power 150, and a 44-inch achromatic, power 70. The planet disappeared gradually, and the convex edge of the moon did not appear broken or altered. The part of the ring which disappeared last was as bright and well-defined as a brilliant star of the 5th magnitude, and was longer in disappearing than the rate of motion of the other parts gave reason to expect. At the emersion, the planet appeared small, dull, and gauzy. At three or four diameters' distance from the moon it appeared as usual (as to size), but the colour was a yellowish-green, somewhat like that of dull, or what is technically called "mat," gold. The whole time of the occultation was 1^h 0^m 52^s.

2. Mr. Holehouse observed the same at Islington, with a 7-feet achromatic, power 100. When the body of the planet was nearly hid by the moon, a faint concussion of light appeared on the moon's dark limb. At emersion, the planet was of a leaden hue, and apparently diminished in size. Mr. Holehouse thinks the diminution and change of colour lasted until *Saturn* was 15 minutes distant from the moon.

3. Mr. Snow observed the same occultation. The times, &c. are as follow:

Immersion at Moon's dark limb.

	True sidereal time. h	m	s
Saturn's first limb	12	12	14,6
Saturn bisected *apparently*	12	12	36,5
Saturn's second limb	12	13	3,5
Second edge of *Saturn's* ring	12	13	33,5

Emersion at Moon's bright limb.

First edge of *Saturn's* ring	13	12	31,5
Saturn's second limb	13	12	58,5
Second edge of *Saturn's* ring	13	13	15,5

From the above observations.

Ingress of *Saturn's* centre	12	12	39	pretty certain.
Egress of do.	13	12	53	uncertain to about 1s.

Moon's $\mathcal{R}$ on the meridian the same evening, $10^h\,39^m\,0^s,06$ well observed.

"There was not the slightest appearance of any projection at either the immersion or emersion. Though the whole phenomenon was seen through thin creamy clouds, the arc of the moon's dark limb was quite clearly defined on the disk of *Saturn* at the immersion; and at the emersion, *Saturn* appeared quite distinct from the moon's bright limb, and so much darker, that it was difficult to observe its egress. There was a very marked difference, in this respect, between the occultation of *Jupiter* that happened last summer, and this occultation of *Saturn; Jupiter*, at his immersion, appearing nearly as bright as the moon.

"The telescope used was a 42-inch refractor. For the immersion, a power of 180, adjusted to *Saturn;* for the emersion, a power of 120, adjusted to the moon's bright limb, which, however, was very tremulous and coloured. The evening, altogether, was wild and unfavourable."

III. Observations of the Solstices from December 1829 to December 1831; and Observations of Moon-culminating Stars during the year 1831; made at the Hon. East India Company's Observatory. By Lieut. Johnson. Communicated by Captain Beaufort.

This is the second set of observations forwarded by Mr. Johnson. (See *Monthly Notice* for March.) The solstices were observed with a 4-feet mural circle, having 6 microscopes. The index error was found by Mr. Pond's method of differences between the observed places of the principal stars, and then given in the *Nautical Almanac*. The other reductions are from Dr. Pearson's Tables, altering the coefficient of lunar nutation from 9″,648 to 9″,20. Dr. Young's Tables of Refraction were used.

The latitude, 16° 55′ 24″ N., is the result of several observations, direct and by reflexion, of the principal stars in the Greenwich Catalogue. The longitude has hitherto been assumed $22^m\,30^s$ W., but a mean of three observations of moon-culminating stars with corre-

sponding observations at Greenwich, gives $22^m\ 57^s,5$ W., which corresponds very nearly with that given by Capt. Owen. The mean obliquity at the different solstices is as follows:

December 1829, 1830, 1831,	St. Helena.....	23° 27′ 38″,96
	Greenwich.....	40 ,19
	Diff.	−1 ,23
June 1830, 1831,	St. Helena.....	23° 27′ 43 ,65
	Greenwich.....	42 ,56
	Diff.	1 ,09

If Bradley's Refractions had been used, the obliquity at the northern solstice would have been reduced about 0″,65, and that at the southern, 0″,14.

IV. On the Calculation of the Geographical Longitude and Latitude of a place whose Geodesic Distance from the Meridian and Perpendicular of another place is given, the Earth being considered as a Spheroid. By Baron Zach.

The formula used by Baron Zach is one given by M. Oriani in the year 1805, and published in the *Correspondance Astronomique*, Vol. XI. p. 550. It was used by Captain Kater, as more convenient than any other. It is as follows:

Let a, b, and e be respectively the semi-major and semi-minor axes and the excentricity of the terrestrial spheroid: M the linear distance of the point whose longitude and latitude are required from the *perpendicular* of the given place: P the linear distance of the first place from the *meridian* of the second: m and p the two last-mentioned distances in seconds: L the latitude of the given place: λ that of the intersection of the line on which P was measured with the meridian of the given place: φ and u the latitude and longitude required: ψ, a subsidiary angle. Then

$$\text{I.}\quad \lambda = \mathrm{L} \pm m\left[1 - \frac{3}{2}e^2 + 3e\cos^2\left(\mathrm{L} \pm \frac{m}{2}\right)\right]$$

$$\text{II.}\quad \psi = p\left[1 - \frac{3}{4}e + 2e\cos^2\lambda\right]$$

$$\text{III.}\quad \sin\varphi = \sin\lambda\cos\psi.$$

$$\text{IV.}\quad \tan u = \frac{\tan\psi}{\cos\lambda}\left[1 - e\cos^2\lambda\right].$$

M. Zach has adopted a *mean spheroid*, as recommended by M. Gauss; that is, one which shall most nearly represent the various measures, without being deduced from any one in particular. By applying the method of least squares to a number of latitudes, as determined both by astronomical observation and geodesical measurement, M. Schmidt has found the following elements: $a = 3271852{,}32$ toises; $b = 3260853{,}70$; length of a mean degree $= 57008{,}655$ toises $= 364547{,}1$ English feet; the compression $\left(\frac{a-b}{a}\right) = \frac{1}{297{,}479}$, and $e = \cdot 00335617$. Hence (M and P being in feet),

$$m = \frac{3600}{364547{,}1}\mathrm{M}, \text{ or } \log m = \log \mathrm{M} + 7\cdot 9945489$$

$$p = \frac{3600}{364547{,}1}\mathrm{P}, \text{ or } \log p = \log \mathrm{P} + 7\cdot 9945489$$

The factors in I., II., and IV., which are contained in square brackets [ ], being functions of e and $L \pm \frac{m}{2}$, have been calculated by M. Zach for the above-mentioned value of e, and for every degree of latitude up to 70°. The following modification of formulæ III. and IV. is also given, as one which may be used with advantage, ψ being in seconds, and the logarithms of ϱ and r being 4·3845549 and 8·8940285.

$$\varphi = \lambda - \varrho\, \psi^2 \tan \lambda,$$
$$u = \psi \sec.\lambda\, [1 - e \cos^2 \lambda]\, (1 - r\, \psi^2 \tan^2 \lambda\, [1 - e \cos^2 \lambda]^2).$$

M. Zach has also given a table of the correction which must be applied to m, in order to give the second term of (I.), for every ten minutes of latitude from $L \pm \frac{m}{2} = 50°$ to $L \pm \frac{m}{2} = 60°$, the known place being the Observatory of Greenwich. This table is intended to facilitate the application of the method to all measurements taken in the United Kingdom.

M. Zach applies his method to two examples: 1. The determination of the position of Calais with respect to Greenwich: 2. That of Fort Mont-jouy, near Barcelona, with respect to Dunkirk, involving the longest distance measured in the French survey (*Base du Système Métrique*, Vol. III., p. 268). The differences in latitude and longitude between the result of the present method and that of Captain Kater, in the first example, and the result of astronomical observation in the second, are 0″,11, 0″,43, and 0″,1, 0″,28.

V. Mean Right Ascension of Fifty-five Unknown Stars, observed in 1831, with a Transit Instrument of twenty inches focus, and a Sidereal Chronometer beating half seconds; also Occultations observed in the month of March 1832. By Mr. Snow.

VI. Fifth Catalogue of Double Stars observed at Slough in the years 1830 and 1831, with the 20-feet Reflector, and reduced to the epoch 1830·0. By Sir J. W. F. Herschel, K.G.H.

VII. Observed Occultation of Aldebaran. By Mr. Rothwell. Communicated by Mr. Tulley.

Mr. Rothwell observed the occultation of *Aldebaran* on the 8th of February, and saw no projection or change of colour whatever. He also observed a star which came so nearly in contact with the moon as to induce him to expect an occultation, without seeing any remarkable circumstance.

VIII. Ephemeris of Encke's Comet, for the Southern Hemisphere. From Professor Encke.

The elements given by Professor Encke are as follow.

Epoch, 1832, May 4,0. Paris Mean Time.

Mean Anomaly	0° 0′ 20″,86	
Mean Daily Motion	1071″,32651	
Longitude of the Perihelion	157° 21′ 32″,2	from mean equinox of May 4,0.
——— Node	334 32 4,1	
Inclination	13 22 12,3	
Angle of excentricity	57 43 17,0	
Log. Semi-major axis	0·3467232	

IX. Stars observed with the Moon, at the Royal Observatory, Greenwich, in May 1832.

		Transit Clock. h m s	Daily Rate.
May 8.	ϱ Leonis	10 24 29,00	
	☽ 1 L.	10 38 22,77	− 0ˢ,97
	(12) Leonis	11 5 49,34	
9.	☽ 1 L.	11 31 55,53	− 0ˢ,88
	b Virginis	11 51 51,80	
10.	b Virginis	11 51 50,70	
	☽ 1 L.	12 23 28,62	− 0ˢ,78
	γ^1 Virginis	12 33 39,54	
13.	2 Libræ	14 14 52,22	
	(127) ——	14 28 32,54	− 0ˢ,72
	☽ 1 L.	14 53 41,20	
	γ Libræ	15 26 36,92	
15.	χ Ophiuchi	16 17 44,48	− 0ˢ,88
	☽ 2 L.	16 37 49,06	

X. After the reading of the preceding communications, Mr. Sheepshanks made some remarks upon the mode of adjusting the transit instrument, and proceeded to describe minutely the various corrections requisite for obtaining correct results, illustrating his statement from various transit instruments furnished for the occasion by Messrs. Troughton and Simms.

J. Moyes, Castle Street, Leicester Square.